ANALYSIS OF DOCUMENTARY AND TERMINOLOGICAL NEEDS OF DOCTORS AND MEDICAL TRANSLATORS AS A BASIS FOR THE DEVELOPMENT OF A NEXT-GENERATION MULTILINGUAL DICTIONARY[1]

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Abstract

The objective of this study is to develop a multilingual lexicographical resource aimed at doctors and medical translators. Due to the fact that these two groups have different needs, current resources are unable to satisfy both equally. Our premise is that it would be possible to design a single adjustable, adaptable and flexible tool which could address their different expectations, needs and preferences. The development of this tool is underpinned by empirical user analysis through an online trilingual survey.

Key words: E-lexicography. Doctors. Medical translators. Needs analysis. Users questionnaire.

[1] This article is the English version of "Análisis de necesidades documentales y terminológicas de médicos y traductores médicos como base para el diseño de un diccionario multilingüe de nueva generación" by Gloria Corpas Pastor & Marina Roldán Juárez. It was not published on the print version of MonTI for reasons of space. The online version of MonTI does not suffer from these limitations, and this is our way of promoting plurilingualism.

1. Introduction

The present work is part of the framework of two R&D projects currently being carried out: TELL-ME: *Towards European Language Learning for MEdical professionals* (517937-LLP-2011-UK-LEONARDO-LMP) [2] and INTELITERM: *Sistema INTELIgente de gestión TERMinológica para traductores (Intelligent terminology processing system for translators)* (FFI2012-38881. MEC, 2012-2015). Our theoretical framework is based on the work by Bowker and Corpas Pastor (2014/in press) on translation technologies and electronic resources used in professional translation as well as in the general bases of electronic lexicography. (Bergenholtz and Bothma, 2011; Fuertes Olivera and Bergenholtz, 2011; Fuertes Olivera, 2012; Granger and Paquot, 2012) and in specialised lexicography (Bergenholtz, Henning and Sven Tarp, 1995; Tarp, 2010; Fuertes Olivera and Tarp, 2014/in press).

Generally, the same kind of lexicographical resources are designed for both groups (doctors and medical translators), despite having dissimilar needs. Thus far, no unique and flexible resource has been made so that it can equally satisfy both groups. The pages that follow outline the possibility to design a new lexicography tool which will allow the needs of two groups of professionals to be met; the two are closely linked but experience different information needs. This study demonstrates that there are substantial differences between the two, making it clear that the resources being used cannot properly and equally satisfy their needs. However, we assume that the creation of a flexible and adjustable resource based on the different needs of users would be perfectly viable. This new and unique lexicography tool would pursue the following goals: a) to bring together an extremely significant amount of expert medical knowledge, which is currently spread throughout the Web 2.0, into one single resource; and b) to enable the needs of doctors and medical translators (and interpreters) to be met equally while also taking into consideration the individual diversity of potential users.

We have used empirical methodologies in order to establish user profiles and be able to propose guidelines according to the results obtained. The methods used include documentary and introspective hermeneutical methods as well as an expert panel. After a comparative study of different online servers was carried out, we opted for a trilingual questionnaire which was distributed using lists and virtual professional translator and medical communities (colleges, associations, hospitals, etc.).

Relevant conclusions have been obtained by analysing the results, including the gender of the people surveyed, their academic training in medicine and translation and the situations in which they use the foreign languages they speak. The results display substantial differences between doctors and medical translators in their preferences and documentary and terminological needs. However, both groups agree and have indicated that the availability of a next-generation dictionary (such as the one proposed here) would greatly benefit them.

2. Previous related work

Some previous studies carried out in the bio sanitary field have to be mentioned due to being closely related to ours. Actually, we are not the first to propose the development of a similar resource aimed at doctors and medical translators. Reimenerink (2003), for instance, tries to discover what kind of writing tool is preferred by health professionals and medical translators when writing or translating research articles. We agree with the author, since the following conclusion is reached: "one sole tool with a wide range of components could solve the problems

[2] http://tellme-project.eu/.

of both groups, as long as this tool were to be flexible in order to adapt to the needs of each user" (Reimenerink, 2003: 125).

Mayor Serrano (2010) analyses the results of a survey assessing electronic resources for the translation of healthcare products which is distributed through two discussion lists on medical translation, MedTrad and Tremédica. The objective is to find out if such resources meet the expectations and demands of medical translators. In order to do this, a collection of tools (regulations, legislative and terminology resources), available at the time, were assessed taking into account the opinions of these professionals recorded in the survey. The author reaches two main conclusions. Firstly, the lack of terminology resources (monolingual and multilingual) for healthcare products is confirmed despite the fact that such terms are present in a great number of documents and despite the serious consequences that such mistakes in terminology can lead to. Secondly, it is pointed out that the small number of existing resources do not follow the methodology of the terminology task and are, as a result, not reliable and do not meet the needs of translators. Some of these shortcomings include that glossaries available online are usually monolingual, they do not offer equivalents in other languages or examples of usage in a context, they only cover a small part of the field of medicine (which is extremely broad) and they are not usually kept up-to-date.

The usefulness of this study in the development of our survey has been immense due to the fact that the shortcomings in current available resources for medical translators have become items of our survey, which is aimed at doctors as well as medical translators.

The Dictionary of Medical Terms[3] (*Diccionario de Términos Médicos*, DTM) by the Royal National Academy of Medicine (*Real Academia Nacional de Medicina*) was a reference for us. It is a new work written by translators and lexicographers within a medical institution. Its macrostructure and microstructure show that the needs of potential users: Latin American doctors and language professionals (philologists, translators, writers, journalists, etc.) are well known by the authors. The DTM is available in paper and electronic formats. The nomenclature includes simple and complex lemmas, whose entries offer complete information: normalised nomenclature, abbreviations, acronyms and synonims, among others. The electronic dictionary contains all the lemmas of the one on paper, but lets the user access the entries flexibly and modularly. In addition, simple searches as well as advanced searches can be performed with its search engine. A simple search can be performed by similarity (hierarchical spelling proximity), by simple and complex lemmas (that include the search word), by truncated character strings (at the beginning, at the end or in the middle of the word), in each information field of the entry and by equivalents in English. The advanced search includes every possibility above, but in this case it is also possible to use Boolean operators in order to perform selective, combined and personalised searches.

The DTM was quite helpful when approaching the tool design and making our survey. Therefore, we consider it one of our closest references, since it has been written by the groups of professionals our resource is aimed at.

3. Description of the study

In order to carry out our study, we designed a trilingual questionnaire (Spanish, English and German). These languages were chosen for sociodemographic reasons.[4] Also, according to the OECD[5] statistics, these three languages have the highest number of speakers, and they provide the main body of medical services and mobility of medical professionals.

[3] http://dtme.ranm.es/index.aspx.

[4] Europeans and Their Languages. 2006. [online]. URL: <http://ec.europa.eu/public_opinion/archives/ebs/ebs_243_en.pdf.mit.unibo.it/>. [Access: 1st of April 2013].

[5] OECD <http://www.oecd.org/statistics/ [Access: 1st of September 2013].

Our questionnaire was divided into three sections with a total of 26 questions. The questionnaire was originally written in Spanish and was later translated into English [6] ("Documentary and terminological needs of doctors and medical translators at work") and German; all three versions were revised by native speakers. Table 1 shows the structure of the questionnaire in sections, indicating the number of items per section and the questions raised.

SECTIONS	N.º	THEME
I. Personal information	5	1) Sex 2) How old are you? 3) What is your nationality? 4) What is your native language? 5) Do you speak any other languages fluently?
II. Professional information	8	6) In which country do you currently work? 7) How long have you been working? 8) What qualification do you have in medicine? (where applicable) 9) What qualification do you have in translation? (where applicable) 10) Which languages do you normally translate into? (where applicable) 11) Which languages do you normally translate from? (where applicable) 12) Which is your medical speciality (for doctors) and/or about which specialities do you translate in most cases (for translators)? 13) In which situations do you use the foreign languages you speak?
II. Documentary and terminological needs	13	14) What kind of dictionary would you prefer? 15) What kind of language combination would your prefer? 16) How should the terms of the dictionary be organised? 17) What kind of information should each term of the new generation dictionary include? 18) Should information which has not appeared in the previous question be included? 19) Which other resources should the new generation dictionary have? 20) Which search tools should the new generation dictionary have? 21) Which other resources should the new generation dictionary include? 22) What format would you prefer the dictionary to have? 23) If the dictionary were electronic, what configuration would you prefer the tool to have? 24) If the dictionary were electronic, how would you prefer updates to be performed? 25) If the dictionary were electronic, please rank from 1-4 your preferred access platforms (1 for your first choice and 4 for less preferred option) 26) Additional comments or suggestions

Table 1. Structure of the questionnaire

[6] The questionnaire in English can be found in Appendix I.

Selecting the items of a questionnaire is complex, given the relevance of the results depends on the items chosen. Accordingly, section number one has equal importance to the subsequent questions such as gender or age help in the identification of sociological conclusions (CIS, 2013). All questions in the first section are compulsory, except for question 5, since some doctors might not be fluent in any language other than their native one). As we want to design a lexicographical tool, questions concerning the languages mastered by potential users are truly important not only in this section, but also in the next one, because gradually we would like to include more languages in our tool (in addition to Spanish, English and German) so as to enlarge its scope.

Questions in the second section were designed to find out how frecuently doctors translate (professionally or not, with or without academic training) and viceversa, and how this this influences their preferences concerning our tool. Questions 8 and 9 in this section are also obligatory because their options include "no academic training". However, the two questions that follow are optional because they ask about use of languages in translation and not all members of the target groups carry out translations (as is the case of many doctors).

Lastly, the third section combines all questions referring to the elements and layout that the next-generation dictionary should incorporate (as can be seen in Table 1). More specifically, questions are asked about the fields of medicine which should be covered, the number of languages it should take into account, the manner in which the terms should be organised, the information and resources it should include (online search tools among many others), the format, configuration (modular or non-modular), the manner in which the dictionary is updated and the access platforms through which it should be available. These items were chosen after a thorough research about biomedical tools and studies aimed at the groups of professionals in question: Reimenerink (2003), Mayor Serrano (2010), Dictionary of Accounting (Aarhus University) and the DTM (Royal National Academy of Medicine).

In reference to the kind of questions used, the information required at each point leads unavoidably to one or another kind of answer; for instance, the question about gender has only one option, the one about native language has two (there might be bilingual people), the one on medical speciality has multiple options, etc. However, questions 17, 19, 20 and 21 are of the matrix type as they require the user to rate (necessary, convenient or not important) the different elements that the next-generation dictionary could include.

4. Selecting the server

Once the objectives of the research have been set, the two groups (whose profiles, needs and expectations we want to define) have been established, and the design and creation of the trilingual questionnaire has been completed, the next task involves distribution of the survey and collection of the information obtained through the questionnaire. In order to get to the largest number of professionals in the shortest time possible and at a low cost, we decided to create an online survey using an online application that designs web surveys (e-survey) and launch it using Web 2.0. This type of e-survey consists of putting a questionnaire on a website and emailing the link to possible participants or to distribution lists, forums, professional associations as well as relevant social networks.

For the purposes of our research we believe that the advantages of this kind of survey (range, rapid diffusion, low cost, easily collected and processed information) far exceed its possible disadvantages, such as the difficulty in measuring the level of representation of those being surveyed due the impossibility of verifying their identity.

At present, numerous e-survey servers are available which offer users the possibility of editing and publishing surveys online in a simple, user-friendly way. Of the many existent servers, we considered four for our study: Google Drive (GD), SurveyMonkey (SM), TELL-ME (TM) and Lime Survey (LS). We chose the first two because they are the most well-known free servers available in the current market; the third one, because it is the server of the platform of a

project within the framework of this research; and the last one, because it is made available to researchers and teachers by the University of Málaga.

In order to select the server best suited to our research, we created an assessment template (see Table 2), adapted to our priorities and interests. The list of requirements was as follows:

a) Unlimited number of questions or answers. It is preferred that there be no limit to the number of questions or answers received seeing as the final impact, range or number of people responding are unknown factors.
b) Intuitive interface. We are looking for an interface that will make editing the survey easy, saving time which can be used in the creation of the questionnaire and allowing for more attention to be paid to the results and design of the dictionary.
c) Multilingual questionnaires. For the objectives of our research, it was best to publish the survey in three languages (English, Spanish and German) seeing as we aim to find out the opinions of people from different nationalities so that the dictionary may meet the needs of a greater percentage of the world's population.
d) One single link. As well as being able to create the surveys in several different languages, we also need to be able to generate just one single link from which the questionnaire can be filled out in all of these languages. It must also allow us to analyse the results jointly seeing as we aim to find out the needs of doctors and medical translators without taking into consideration their nationality or the language in which they have completed the questionnaire.
e) Automatic processing of information. It would be extremely helpful if the program were to automatically process the results and extract statistical data or in percentages.
f) Export Format. It is a requirement that the processed results may be exported in different formats (.xl, .doc, .pdf, etc.).

	REQUIREMENTS	GD	SM	TM	LM
a)	Unlimited number of questions or answers	√	—	√	√
b)	Intuitive interface	—	√	√	√
c)	Multilingual questionnaires	—	—	√	√
d)	One single link	—	—	√	√
e)	Automatic processing of information	√	√	—	√
f)	Export Format	√	√	√	√

Table 2. Assessment template

As we can see in Table 2, all four e-survey servers allow the data to be exported in different formats, as well as extracting graphs, diagrams and percentages (except TELL-ME). Google Drive has a poor and not very intuitive interface, this, combined with its inability to create multilingual questionnaires with a single link has led us to dismiss it from the beginning. The same applies to SurveyMonkey, which has the added limitation of no longer being free once the 10-question or 100-answer limit has been reached.

Of all of them, Lime Survey fulfils all the established requirements and is, as a result, the server chosen to carry out our research.

Lime Survey is a free survey server with an intuitive and easy-to-use interface. It also automatically processes the data and exports the results in different ways and formats.

Creating a multilingual survey is made easy. What's more, even though the survey is published in different languages, the program can generate one link[7] for all of them; one which will take us to the survey's homepage and from which we can choose the language. If, however, we want to offer a group of people the link in, for example, English (because we know that the

[7] The link generated for the prototype of the survey is: <http://encuestas.sci.uma.es/65368/lang-es>. However, it is not possible to access it online because it is no longer active.

native language of the entire group is English), the program also gives us the option of generating a direct link to the survey in each of the languages.

This does not mean that the survey's ID changes, and therefore the extraction of the data will not be affected. In this way of proceeding, the three links generated when a survey is created in English, Spanish and German would be the following:

<http://encuestas.sci.uma.es/65368/lang-es>;
<http://encuestas.sci.uma.es/65368/lang-de>;
<http://encuestas.sci.uma.es/65368/lang-en>.

The key for results to be obtained automatically and independently of the language in which the questionnaire has been answered is that each question is assigned a univocal code, independent of the language in which the question has been written. Subsequently, the program takes into account the question's code and not the languages.

Finally, during the creation and edition of the trilingual questionnaire, we decided to distribute the same questionnaire to the two target groups. Seeing as it was of utmost importance that the information from the group of doctors and the group of translators be obtained separately, in order to find out if one tool could meet the needs of both, we decided to generate two links with the same survey: one to be distributed among healthcare staff (ID: 69713), the other, among translators (ID: 81953).

The only difference between the surveys in the two links was that the one aimed at doctors included brief explanations of specialised linguistic terms (e.g. *corpus*) the first time they appear. This did not affect the data but made the survey clearer to one of the target groups.

5. Distribution and data collection

Once the trilingual questionnaire was created using Lime Survey, we proceeded to distribute the corresponding links to doctors (ID: 69713) and medical translators (ID: 81953) with the objective of achieving the greatest possible diffusion and most representative number of responses from the target groups. The questionnaire was activated on the 31st of May 2013 and, in order to carry out a final review, the survey was distributed the next day (1st of June 2013). Forums, email and distribution lists were used to distribute the survey with the one aimed at doctors being sent to the MEDIRED mailing lists (used for the diffusion of medical information resources) and MEDFAM-APS (mailing list for family medicine and primary healthcare) as well as the Mancia.org forum (medical forum for students, doctors and other healthcare professionals). Via email we contacted doctors from the Quiron Hospital[8] in Málaga, as well as doctors, medical associations and hospitals in Spain, Great Britain and Germany, who are collaborating at present with the TELL-ME Project.

For the translator target group, the survey was distributed through the following mailing lists: MEDTRAD (professional translators in the field of biomedicine), TRADUCCIÓN (aimed at translators in Spain), PROTECT (technical-scientific translators) and Medical translation (medical translators). The Proz.com forums [9] (international website aimed at translators, interpreters and translation agencies) were also used and TranslatorsCafe.com (international directory of translators, interpreters and translation agencies). International translation companies were contacted via email (such as Confluent Translations and Adams Globalization

[8] We would like to thank Clara I. Hernández, commercial manager of the Quirón Hospital in Málaga, for her cooperation.

[9] According to the survey carried out by the EUATC (2013: 16) (Tirry, 2013), the presence of Great Britain, Spain and Germany in Proz.com and TranslatorsCafe.com is much higher than the other countries surveyed (except America and China due to number of inhabitants).

among many others), translation and interpretation associations (e.g. the International Association of Medical Interpreters) as well as translators linked to the ACT and the EUATC[10].

As well as deciding on the best means of distributing the survey, it is essential to have a good distribution message which will have an impact on the recipient and ensure that he/she provides the information being asked for. In order to achieve this, a good format is of great help, and certain elements cannot be missing from such a message, namely: i) the projects included within the framework of the research[11], of which the survey is part of (this guarantees the trustworthiness of the study); ii) information on what the survey is about, so that the recipient has a general idea of what questions may be asked; iii) the objective of the survey, that is, to what ends the results are going to be used (so that the recipient can decide whether he/she is interested or not); iv) a sentence encouraging the recipient to answer, which includes the statement that his/her cooperation is essential in obtaining reliable results; v) the estimated amount of time it takes to fill out the survey; vi) acknowledgements and expressions of gratitude; and, optionally, viii) the offer to send them the results of the survey if they would like them.

The number of responses received after having kept the survey active on Lime Survey from the 31st of May until the 20th of June 2013 was 185. Of these, 128 were received through the link aimed at translators and interpreters (50% complete) and 57 (56.14 %) through the one aimed at healthcare professionals. It is understandable that not all responses are complete due to the numerous circumstances in which said professionals may find it difficult to finish the questionnaire. It is important to point out that the total number of valid responses cannot guarantee the representativeness of the sample,[12] but this fact does not invalidate these results, since interesting conclusions can be drawn from them.

6. Results and discussion

Due to space limitations we cannot explain in detail the personal and professional profiles of each target group. We will, however, highlight some points. Most of the healthcare professionals work in Spain (84.21%), although we have received some responses from British, German, Argentinian and Canadian doctors. Their native languages coincide with the language of the country in which they work, although some of them are bilingual and almost all of them speak English as a second language fluently as well as some other European languages. Cooperation of female doctors is slightly higher (53,12 %) than that of male doctors. Mostly, they have over 15 years work experience (40.62%), while others have fewer than five years (31.25%) and between five and 15 years (28.13%). All are graduates and have degrees in medicine (except one student), and the most common medical speciality is family medicine, which is in accordance with the high rate of participation from members of the MEDFAM-APS list. Nevertheless, the variability of responses was wider than we had foreseen. In fact, 11 respondents chose the option "Others" and indicated specialities like intensive medicine, podiatry or palliative medicine.

[10] We would like to thank Juan José Arevalillo Doval of Hermes Traducciones y Servicios Lingüísticos (Hermes Translations and Linguistic Services) for his invaluable help in distributing the survey among translation companies and self-employed translators.

[11] In our case, the research projects TELL-ME and INTELITERM and the Lexicography and Translation research group (HUM-106).

[12] The sample of other surveys, which were made also in the framework of TELL-ME project (aimed also at British, German and Spanish professionals), was higher and more balanced. This survey was also distributed between doctors that in other occasions had answered other surveys within the TELL-ME project, but in our case the sending of the distribution message was done by a person unknown for these doctors. In those other occasions contributors in the TELL-ME project had contacted the doctors directly, and this fact could have affected the sample of the present study.

Sports medicine	1	Paediatrics	1
Family and community medicine	18	Psychiatrics	0
Forensic medicine	0	Rheumatology	0
Preventive medicine	1	Surgery	1
Allergy	0	Gynaecology	1
Anaesthesiology	0	Ophthalmology	0
Gastroenterology	1	Otorhinolaryngology	0
Cardiology	1	Urology	1
Endocrinology	2	Immunology	0
Neurology	2	Microbiology and parasitology	1
Oncology	0	Radiology	0

Table 3. Medical speciality of healthcare professionals

As for the situations in which they use the foreign languages they speak, the doctors state that they mostly use them when reading research articles (90.62%) and when communicating with foreign patients (59.38%). However, 25% use them to publish research articles, 18.75% when communicating with healthcare professionals from other countries and 12.5% for translating, although 84% state that they do not have any academic training in translation. As for the languages from/to which they translate, the responses vary, although 50% say they translate from to from Spanish to English and 62.5% from English to Spanish.

In the second target group (translators and interpreters), the majority of participants are female (75%). It is possible there are more women carrying out this profession (which would be in accordance with the ratio among students), or that women tend to participate more in surveys in general. As for the nationalities, 53.12% of those surveyed came from Spain; 9% from Great Britain; 3% from Germany and 34% from other countries including Argentina, Venezuela, America, Italy, Russia, Austria, Holland, Canada, Israel and France. There is a higher number of bilinguals in this group (19%) and, as can be expected, the range of other languages spoken is much wider and varied than that of the doctors. While the doctors, in general, do not speak a foreign language (43.75%), or they speak just one other language (37.5%), translators tend to speak two languages other than that their native one (43.55%), one other language (27.42%), four other languages (14.52%) or three (14.52%). There is a small percentage of these (4.83%) who, while bilingual, do not speak an additional language.

The majority of translators who took part in the survey work in Europe (60.94% in Spain), although some also work in America, Canada, Israel or Argentina. As with the doctors, the most expert translators were also the most cooperative (40.62% of the translators who took part had more than 15 years work experience). As for academic training, translators educate themselves much more in medicine (71.87%) than doctors do in translation (18.76%). What's more, the academic training of the translators ranges from specific training courses (35.94%) to doctorate or postgraduate (other: 14%), and college degree (15.62%). However, not all medical translators have had academic training in translation (9%).

Medical translators normally tend to use the foreign languages they speak in a greater variety of communicative situations. The variability of languages from/to which they translate is much higher than in the case of healthcare professionals, although English is still the most frequent source language (81.25%) and Spanish is the most frequent target language (62.5%). The medical specialities they translate are not limited to the options indicated in the survey and they mention many other fields such as electro medicine, epidemiology, pharmacology, dentistry and veterinary medicine, etc. in the option "Others" (27 responses).

Sports medicine	7	Paediatrics	11
Family and community medicine	15	Psychiatrics	7
Forensic medicine	5	Rheumatology	8
Preventive medicine	14	Surgery	8

Allergy	7	Gynaecology	8
Anaesthesiology	6	Ophthalmology	9
Gastroenterology	6	Otorhinolaryngology	2
Cardiology	20	Urology	2
Endocrinology	9	Immunology	9
Neurology	12	Microbiology and parasitology	9
Oncology	24	Radiology	9

Table 4. Most frequent medical specialities in medical translation

The results of Sections I and II of the survey, which we have just explained briefly, allow us to contextualise and understand the type of user they are, thereby establishing a connection between their personal and professional characteristics as well as their expectations as far as the dictionary we propose is concerned (Section III of the survey).

We will begin with the healthcare professionals group. As for the medium, macrostructure and layout of the dictionary, most prefer a general medicine dictionary (75%), bilingual (59.38%), semasiological (that is, its terms should be organised alphabetically) (78.12%), online (84.38%), adjustable (that it be possible to choose the information needed on a term) (62.5%) and that its updates be automatic (50%). As for the dictionary's access platform, the order of preference chosen by the great majority was, in first place, Windows; in second place, Android mobile; in third place, iPhone; and last place, Macintosh.

These were the preferences indicated by healthcare professionals as far as the layout is concerned, we will now proceed to analyse the elements listed in the survey that they could consider necessary, convenient or not important. We have organised the results in tables to make reading and forming of conclusions easier.

NECESSARY ELEMENTS	PERCENTAGE
Definition in the language in which the term is searched for	53.2
Translation of the term in the suggested languages	81.25
Translation of the term's definition in the suggested languages	43.75
Phraseological information (collocations, idiomatic expressions) of the term and its equivalents[13]	46.88
Syllabication / pronunciation	56.25
Eponyms (e.g. Hashimoto's thyroiditis, Alzheimer's disease)	65.62
Popularised equivalents	50
Links to other elements in the dictionary (connecting related terms)	59.38
Prescriptive indicator (lets the user know which variant is better suited to a particular register)	59,38
CONVENIENT ELEMENTS	**PERCENTAGE**
Grammatical information	53.12
Etymological information	46.88
Phraseological information (collocations, idiomatic expressions) of the term and its equivalents	46.88
Encyclopaedic and cultural information	59.38
Examples of use taken from corpora texts	40.62
Links to these corpora[14]	43.75
Synonyms and antonyms	53.12
Homonyms and polysemic terms	53,12
Illustrations and images	46.88

[13] This element has been rated by healthcare professionals as both necessary and convenient.
[14] This element has been rated by healthcare professionals as both convenient and not important.

Acronyms	50
System introduction (text that summarise disciplines or sub disciplines whose terminology is available in the dictionary)	53.12
Access to concept maps on the selected term (like the ones offered by Mindpedia)	56.25
NOT IMPORTANT ELEMENTS	PERCENTAGE
Links to these corpora	43.75

Table 5. Necessary, convenient and unimportant information that should be included in the dictionary, according to healthcare professionals

The only additional information given by one of the participants was in answer to the following question: "Should information which has not appeared in the previous question be included? (no. 18)". The participant replied that it would be interesting for the dictionary to include common expressions which professionals use colloquially in their daily practice.

In order to find out the opinion of the participants on the usefulness of search tools which could be included in the next-generation dictionary, we have created a separate table.

NECESSARY SEARCH TOOLS	PERCENTAGE
Access to one or more search engines and/or specialised metasearch engines selected by the user him/herself (allowing them to use search engines they are familiar with without having to log out of the dictionary)	62.5
CONVENIENT SEARCH TOOLS	PERCENTAGE
Access to the invisible web (which contains information that cannot be accessed via everyday search engines)	43.75
Access to portals and directories in relation to general medicine or to the medical speciality in question (e.g. Healthware Freeware)	56.25
Access to metadictionaries (these search for a term in numerous dictionaries and give back the information from all of them on a single page)	62.5
Access to tools that search for the term or collocation needed in dictionaries, glossaries, metadictionaries, e-books, web applications, Wikipedia, etc. and give the results on a single page (e.g. InterTerm)	46.88
Access to tools similar to the previous one which offer the added option of personalising them	59.38
Access to search engines in which you can type in the term in one language and the information it gives back is in a different language(s) to be chosen by the user	59.38
Access to search engines in which you can type in the term in one language and the information provided is in that same language and one other (the results are displayed in two columns: the left being the language we have typed in and the right being the other language)	62.5

Table 6. Necessary and convenient search tools that should be included in the dictionary, according to healthcare professionals

As for the other resources which could be considered for the dictionary, doctors' preferences are as follows:

NECESSARY RESOURCES	PERCENTAGE
Automatic translation system	65.62
Quality control resources (spelling and grammar concordance checkers)	50
CONVIENENT RESOURCES	PERCENTAGE
Tool for creating your own corpus	50
Tool for the automatic extraction of terms	46.88
Simple tool for terminological databases and own glossaries	46.88
Access to forms and distribution lists on medicine and/or medical translation	56.25
NOT IMPORTANT RESOURCES	PERCENTAGE
Access to social networks (groups and accounts specialising in medicine or medical translation)	50

Table 7. Necessary, convienent and unimportant resources, according to healthcare professionals

The second groups analysed, medical translators and interpreters, opted in their majority for a dictionary (or several dictionaries) divided into those of medical specialities (62.5%), bilingual (64.06%), semasiological (78.12%), online (96.88%), adjustable (76.56%) and that updates be semiautomatic (51.56%). As for the access platform to the dictionary the order of preference chosen by the majority was, in first place, Windows; in second place, Android mobile; in third place, Macintosh; and, last, iPhone.

These were the preferences indicated by medical translators and interpreters as far as the layout is concerned; we will now proceed to analyse the elements listed in the survey that they could consider necessary, convenient or unimportant.

NECESSARY ELEMENTS	PERCENTAGE
Definition in the language in which the term is searched for	71.88
Translation of the term in the suggested languages	84.38
Phraseological information (collocations, idiomatic expresions) of the term and its equivalents	57.81
Eponyms (e.g. Hashimoto's thyroiditis, Alzheimer's desease)	50
Popularised equivalents[15]	45.31
Acronyms and abbreviations	70.31
Links to other elements in the dictionary (connecting related terms)	71.88
Prescriptive indicator (lets the user know which variant is better suited to a particular register)	56.25
CONVENIENT ELEMENTS	PERCENTAGE
Translation of the term's definition in the suggested languages	42.19
Grammatical information	56.25
Etymological information	57.81
Encyclopedic and cultural information	60.94
Examples of use taken from corpora texts	59.38
Links to these corpora	57.81
Syllabication / pronounciation	51.56
Synonyms and antonyms	57.81
Homonyms and polysemic terms	56.25
Illustrations and images	56.25

[15] This element has been rated by translators and interpreters as both necessary and convenient.

Popularised equivalents	45.31
System introduction (texts that summarise disciplines or subdisciplines whose terminology is available in the dictionary)	57.81
Access to concept maps on the selected term (like the ones offered by Mindpedia)	57.81

Table 8. Necessary, convienent and unimportant information, according to medical translators and interpreters

As opposed to the doctors, who provided little additional information, translators made many comments in question number 18, in particular that it would be interesting to include under each term the country in which it is usually used (e.g. in the case of English, it would be Great Britain, America, Canada, etc.). One person added that they would prefer a dictionary on general medicine which would indicate to what branch each term belongs. Another commented that even if it were a bilingual dictionary (e.g. German-Spanish), it would also have to include English seeing as it is the reference language for all of them.

The following table shows the opinions of this second group on the usefulness of search tools which could be included in the next-generation dictionary.

NECCESSARY SEARCH TOOLS	PERCENTAGE
Access to one or more search engines and/or specialised metasearch engines selected by the user him/herself (allowing them to use search engines they are familiar with without having to log out of the dictionary)	46.88
CONVENIENT SEARCH TOOLS	**PERCENTAGE**
Access to one or more search engines and/or specialised metasearch engines selected by the user him/herself (allowing them to use search engines they are familiar with without having to log out of the dictionary)	46.88
Access to the invisible web (which contains information that cannot be accessed via everyday search engines)	50
Access to portals and directories in relation to general medicine or to the medical speciality in question (e.g. Healthware Freeware)	53.12
Access to metadictionaries (these search for a term in numerous dictionaries and give back the information from all of them on a single page)	50
Access to tools that search for the term or collocation needed in dicionaries, glossaries, metadictionaries, e-books, web applications, Wikipedia, etc. and give the results on a single page (e.g. InterTerm)	50
Access to tools similar to the previous one that offer the added option of personalising them	65.62
Access to search engines in which you can type in the term in one language and the information it gives back is in a different language(s) to be chosen by the user	56.25
Access to search engines in which you can type in the term in one language and the information provided is in that same language and one other (the results are displayed in two columns: the left being the language we have typed in and the right being the other language)	62.5

Table 9. Necessary and convenient search tools that should be included in the dictionary, according to medical translators and interpreters

As for the other resources which could be included in the dictionary, preferences of medical translators and interpreters are as follows:

CONVENIENT RESOURCES	PERCENTAGE
Tool for creating your own corpus	51.56
Tool for the automatic extraction of terms	51.56
Simple tool for terminological data bases and own glossaries	46.88
Quality control resources (spelling and grammar concordance checkers)	53.12
Access to forums and distribution lists on medicine and/or medical translation	53.12
Access to social networks (groups and accounts specialising in medicine or medical translation)	45.31
NOT IMPORTANT RESOURCES	PERCENTAGE
Automatic translation system	71.88

Table 10. Necessary, convienent and unimportant resources, according to medical translators and interpreters

As for the personal and professional characteristics of our two groups, relevant conclusions on three different aspects have been obtained: gender, academic training in medicine and translation and the situation in which they use foreign languages they speak. However, it has to be pointed out that even though plenty of responses have been obtained from outside of Spain, the majority where Spanish or residents of the country, making the results representative on a national scale. We could not claim with certainty that the results could be extrapolated to Great Britain and Germany, due to the fact that the lexicographical needs of the groups could vary from country to country. Therefore, it would be necessary to increase the number of responses from said countries.

67.71% of participants were women, meaning that when we design our dictionary based on the results of the survey it is foreseeable that once it is active it will be better suited to meet the needs of female professionals rather than male professionals. This is also a reflection of a tendency which has been observed in the last few years of there being a greater female presence in medicine and translation and interpretation degrees.

It appears surprising that only 28.06% of the doctors had academic training in translation, yet, when indicating the languages from or into which they translated we received, respectively, 23 and 32 responses (having obtained a total of 32 surveys filled out by the doctors). Of this information, two possible theories can be obtained: 1) that by "translating" the doctors have understood the word to mean any mental act of translation (e.g. when reading a research article); and 2) that they work as translators with no academic training, something which is astoundingly common.

We try to avoid the first theory by adding a question to the survey on the situations in which they use the foreign languages they speak, among which translation work would be an option; despite this, we do not have sufficient data to clarify this double theory.

As for the situations in which they use a foreign language, under "important information to better suit the dictionary to the needs of participants", doctors selected "Reading of research articles" and "Communication with foreign patients"; translators selected ""Reading of research articles", "Translation" and "Translation revision". From these choices we can deduce that, at first glance, it appears that we can create a dictionary which will meet the needs of both groups because the information needs when reading an article and when translating one are, if truth be told, similar; what definitely ought to be included are searches with multiple directions as far as languages are concerned. However, more thought needs to be given to elements in the dictionary which would be truly useful in doctor-foreign patient interaction.

In light of the results obtained as to the elements the dictionary should include, it has become clear that future surveys should not give the participant the choice between three degrees of necessity: in our case, necessary, convenient and unimportant. This is due to the fact that when the participant is unsure of whether the element is really necessary or not, he/she will simply place it under convenient, which makes it difficult to reach pertinent conclusions.

If we focus on the layout of the dictionary, both groups agree on the majority of aspects (such as that Windows prevails over all other current existing operating systems) except in the following:

- Doctors prefer a general medicine dictionary; translators want independent dictionaries for different medical specialities. This can be solved by creating a single dictionary divided into medical specialities (these would appear in a list on opening the tool), but which at the same time allows for the search of any term without having to first go into the speciality to which it belongs.
- Healthcare professionals prefer updates to be done automatically; translators, semi automatically. This double function could be carried out when the user logs on, with the selection of one of these functions making the dictionary a personalisable tool from the very first moment.

As for the elements that the dictionary should include, opinions of both groups vary. For this, it would be necessary to design the dictionary taking into account the different needs of both groups in relation to the microstructural information elements, so that a flexible and easily adaptable tool can be achieved which will meet the specific needs of both groups and, within these, the different information needs of the individuals.

Ultimately, it needs to be a dictionary that can offer accurate and prompt information in accordance with the needs of the user at a particular moment.

However, we want to highlight that, for doctors, the translation of a term into the suggested languages and the eponyms is highly useful, and that for translators, the definition of the term in the language in which it is being searched for, the links to different parts of the dictionary and the acronyms and abbreviations are (along with the first points mentioned) also extremely important.

Lastly, we would like to point out that even though almost none of the suggested elements were rated as "not important", 71.88% of translators rated an "automatic translation system" as such. On the other hand, 65.62% of doctors considered it necessary to include an automatic translation system. Automatic translation tools are still looked down upon by some, but others consider them to be useful and necessary. This could be interpreted as the eternal conflict (supporters *versus* detractors of automatic translation), or as different perspectives due to different proposed usage (quality translation *versus* "gist translation"). In any case, the role of automatic translation in the field of medical translation, doctor-patient interaction and the general health service could be the object of future research.

7. Conclusions

Despite obvious limitations of our study, mainly the sample of our survey, analysed answers reveal that doctors and medical translators have different needs, preferences and expectations. The ideal dictionary and desired information elements that should be included in the dictionary are also dissimilar; however, communicative situations of both groups of professionals are similar, as we explained in "Results and discussion". Doctors prefer to access the information statically and generally, whereas translators opt for a more controlled, specific and dynamic way of access. These preferences are revealed, when doctors choose a general bilingual dictionary, in which updates are performed automatically, and a machine translation system to be incorporated, whereas medical translators value positively the division of the dictionary into medical specialities, semi-automatic updates and prefer to avoid machine translation systems.

Nevertheless, it is possible to design a lexicographical resource that meets the needs of both groups, in spite of the fact that these groups are different. Nowadays, thanks to electronic lexicography as well as natural language processing good resources and techniques have been developed, so a hybrid, modular and flexible tool, which fulfils the different needs, preferences and expectations registered in our survey, can be designed and made. This one single resource would allow, on the one hand, the gathering of an extremely significant amount of expert medical knowledge, which is currently spread throughout the Web 2.0; and, on the other hand, enable the needs of doctors and medical translators (and interpreters) to be met equally while also taking into consideration the individual diversity of potential users.

In order to develop this kind of next-generation dictionary we need lexicographers, terminologists, translators, doctors, computational linguists and experts in informatics to take part. Thus, we suggest designing a multilingual lexicography resource, in electronic format, semasiological, structured in medical specialities, with varied functionalities, modular, multidirectional and customisable and which would require registration for access. Once registered, the user could choose to access corpora or not, the elements and microstructural information to be retrieved at every moment, how to update the resource (automatically or semi-automatically), which CLIR (*Cross-Language Information Retrieval*) systems and search engines to be included, etc. Finally, searches with multiple directions as far as languages are concerned are essential in order to satisfy the needs of doctors and medical translators.

Our dictionary would be in line with the proposals of Bergenholtz and Bothma (2011), who opt for customisable and multifunctional tools. That is, the user, when chosing the different options which determine the information to be retrieved is, in fact, creating multiple monofunctional dictionaries from a big database. In this way, the needs of the user are always going to be satisfied. Additionally, our tool would be always updated (a main characteristic of the current e-lexicography). Whereas some time ago there were dictionaries that could be valid for years or decades, today it is impossible. Actually, the validity of an entry can even be momentary and brief; therefore, dictionaries should be in continuous re-building process. A good example of a tool with continuous updating is the Dictionary of Accounting (*Diccionario de contabilidad*), developed in Aarhus University, which will probably soon include a daily updating system. In our case, continuous updating would be even more necessary considering the current steady progress in biomedical research.

In conclusion, a medical next-generation dictionary should satisfy the needs of a user in an 'extra-information tool' situation (Bergenholtz and Bothma, 2011: 61-65): a cognitive situation, a communicative situation, an operative situation or an interpretative situation. Cognitive, communicative and operative situations bear a relation to verbal language, and interpretative situations to nonverbal language. The authors maintain that dictionaries are most commonly used in cognitive and communicative situations: when "the potential user has a need for knowledge of some kind […] simply to get the knowledge" or when "the potential user has a problem with or doubts about the process of written or oral communication and needs some help or recommendation". However, if we managed to include in our next-generation dictionary information retrieval and machine translation systems, access to corpora, etc., our tool could be also helpful in operative situations, when "there is a need for guidelines for what and how the user has to act to carry out a certain instruction", need that is usually fulfilled by guides, manuals, road maps or search engines.

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APPENDIX 1. *Questionnaire*
Documentary and terminological needs of doctors and medical translators at work

By means of this questionnaire we expect to ascertain which elements a new generation dictionary should contain in order to satisfy your documentary and terminological needs at work.

The results will be used in the design of a new generation dictionary that fulfils the needs of doctors and medical translators (languages considered: Spanish, English and German).

We would greatly appreciate if you could fill out our online questionnaire. This should take no more than 5-10 minutes.

PERSONAL INFORMATION

1. Sex
   a. Male
   b. Female
2. How old are you?
   a. 20-30
   b. 30-40
   c. 40-50
   d. 50-60
   e. > 60
3. What is your nationality?
   a. Spanish
   b. British
   c. German
   d. Other – please state
4. What is your native language? (choose two if bilingual)
   a. English
   b. Spanish
   c. German
   d. French
   e. Italian
   f. Greek
   g. Arabic
   h. Chinese
   i. Japanese
   j. Russian
   k. Finnish
   l. Dutch
   m. Other – please state
5. Do you speak any other languages fluently?
   a. English
   b. Spanish
   c. German
   h. Chinese
   i. Japanese
   j. Russian

d. French
e. Italian
f. Greek
g. Arabic
k. Finnish
l. Dutch
m. Other – please state

PROFESSIONAL INFORMATION

6. In which country do you currently work?
   a. United Kingdom
   b. Germany
   c. Spain
   d. Other – please state
7. How long have you been working?
   a. 0-5 years
   b. 5-10 years
   c. 10-15 years
   d. > 15 years
8. What qualification do you have in medicine? (where applicable)
   a. Degree
   b. Specific training course
   c. No qualification
   d. Other – please state
9. What qualification do you have in translation? (where applicable)
   a. Degree
   b. Specific training course
   c. No qualification
   d. Other – please state
10. Which languages do you normally translate into? (where applicable)
    a. English
    b. Spanish
    c. German
    d. French
    e. Italian
    f. Greek
    g. Arabic
    h. Chinese
    i. Japanese
    j. Russian
    k. Finnish
    l. Dutch
    m. Other – please state
11. Which languages do you normally translate from? (where applicable)
    a. English
    b. Spanish
    c. German
    d. French
    e. Italian
    f. Greek
    g. Arabic
    h. Chinese
    i. Japanese
    j. Russian
    k. Finnish
    l. Dutch
    m. Other – please state
12. Which is your medical speciality (for doctors) and/or about which specialities do you translate in most cases (for translators)?
    a. Sports medicine
    b. Family and community medicine
    c. Forensic medicine
    d. Preventive medicine
    e. Allergy
    f. Anaesthesiology
    g. Gastroenterology
    h. Cardiology
    i. Endocrinology
    j. Neurology
    k. Oncology
    l. Paediatrics
    m. Psychiatrics
    n. Rheumatology
    o. Surgery
    p. Gynaecology
    q. Ophthalmology
    r. Otorhinolaryngology
    s. Urology
    t. Immunology
    u. Microbiology and parasitology
    v. Radiology
    w. Other – please state
13. In which situations do you use the foreign languages you speak? (choose multiple options if appropriate)
    a. Publication of research articles
    e. Translation

b. Reading of research articles
c. Communication with foreign patients
d. Communication with other professionals (for instance, in congresses, conferences and events)
f. Interpretation
g. Translations revision
h. Other – please state

DOCUMENTARY AND TERMINOLOGICAL NEEDS

14. What kind of dictionary would you prefer?
    a. General medical dictionary
    b. Separate dictionaries (or parts of a dictionary) by specialities
15. What kind of language combination would you prefer?
    a. Bilingual
    b. Multilingual
16. How should the terms of the dictionary be organised?
    a. Semasiological order (alphabetical order)
    b. Onomasiological order (from the concept to its name)
17. What kind of information should each term of the new generation dictionary include?

▪ *Information*	**Necessary**	**Convenient**	**Not important**
Definition in the language in which the term was searched			
Translation into the languages considered			
Translation of the definition into the languages considered			
Grammatical information			
Etymological information			
Phrasal information (collocations, idioms) of the term and its equivalents			
Encyclopaedic and cultural information			
Examples from corpora (set of texts)			
Links to these corpora			
Syllabification / pronunciation			
Synonyms and antonyms			
Homonymous and polysemous terms			
Eponyms (e.g., Hashimoto's thyroiditis, Alzheimer's disease)			
Illustrations and pictures			
Vulgarised equivalents			
Acronyms			

18. Should information which has not appeared in the previous question be included? (text box)

19. Which other resources should the new generation dictionary have?

▪ *Resources*	**Necessary**	**Convenient**	**Not important**
Hyperlinks to other elements of the dictionary (in this way, related terms would be interconnected)			
Indicator of register (indicates to the user which option is considered more appropriate to certain formal or informal contexts)			
Texts summarising the specialities or subspecialities whose terminology is represented in the dictionary			
Access to concept maps about the term selected (like the ones offered by Mindpedia)			

20. Which search tools should the new generation dictionary have?

▪ *Search tools*	**Necessary**	**Convenient**	**Not important**
Access to one or more specialised search and/or metasearch engines selected by the user (in this way, he/she will use the search engines which he/she is accustomed to without leaving the dictionary)			
Access to the Invisible Web (this has information that cannot be retrieved by common search engines)			
Access to portals and directories related to ~~the~~ medicine in general or the medical speciality in question (e.g., Healthware Freeware)			
Access to meta-dictionaries (they look up a term in several dictionaries and display the information of all them in one page)			
Access to tools which search for the term or collocation in dictionaries, glossaries, meta-dictionaries, e-books, web applications, Wikipedia, etc. and retrieve only one results page (e.g., InterTerm)			
Access to tools like the previous one which are also customisable			
Access to search engines that retrieve the information in one or more languages, chosen by the user, different from the language in which the term was introduced			
Access to search engines in which the search term is introduced in one language and the information retrieved appears in this language and another one (the results will be shown in two columns: the language introduced in the search engine to the left; the other language, to the right)			

21. Which other resources should the new generation dictionary include?

▪ *Resources*	**Necessary**	**Convenient**	**Not important**
Tool to compile own corpora			
Automatic term extraction tool			

Easy tool to create own term databases and glossaries			
Machine translation system			
Utilities for quality control (grammar and concordance revision, etc.)			
Access to forums and mailing lists specialised in medicine and/or medical translation			
Access to social networks (groups and accounts specialised in medicine and/or medical translation)			

22. What format would you prefer the dictionary to have? (choose multiple options if appropriate)
    a. Paper
    b. Electronic (e.g. CD-ROM)
    c. Online
23. If the dictionary were electronic, what configuration would you prefer the tool to have?
    a. Modular (the user could choose which information is required from the term to be searched: definition + synonyms; only examples from corpora; synonyms and illustrations, etc.)
    b. Not modular (in every search term, all the information in the dictionary would be displayed)
24. If the dictionary were electronic, how would you prefer updates to be performed?
    a. Automatically
    b. Semi-automatically, asking the user previously if he/she wants to update the content in that moment or in the future
    c. The user should be able to decide when and what content to update and undo any update considered unnecessary
25. If the dictionary were electronic, please rank from 1-4 your preferred access platforms (1 for your first choice and 4 for less preferred option)
    a. Windows
    b. Macintosh
    c. Android mobile
    d. iPhone
26. Additional comments or suggestions

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